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ABSTRACT

This booklet on curriculum is one of a series in environmental education for grades K-12. In this section, four basic concepts are listed and the behavioral objectives, associated subject areas, and key words and definitions are included for each. Three activity options are given for each concept. Information for the teacher includes materials and resources needed for the activity, the procedure, discussion questions, further activities, and sample worksheets. These activities are interdisciplinary in nature and are designed for students in grades 6-8 and 9-12. (MA)

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CURRICULUM

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GRADES
6-8
9-12

ENVIRONMENTAL EDUCATION

VALUES FOR THE FUTURE

ANTIOCH COMMUNITY SCHOOL DISTRICT 34

TITLE IV C ESEA

SE 023 450

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Barrington #220
Emmons #33
Gavin #37
Grass Lake #36
Grayslake #46
Highland Park #108
Highland Park #113
Highland Park #111
Lake Villa #41
Libertyville #70
Lotus #10
Millburn #24
Mundelein #75
North Chicago #64
Oak Grove #68
Prince of Peace
St. Peter's
Stevenson #125
Warren High School #121
Waukegan #60
Woodland #50
Woodland Park #110

Without their recognition of the need for environmental education in their schools we would not have been able to conduct our pilot program in twenty-two school districts in Lake County, Illinois.

Without the assistance of these people and the guidance of the citizens advisory committee we would not have been able to accomplish our objectives.

The program as conceived by Superintendent Henry C. Meyer, William Herbst, and Mary Kern owes much to Dr. William B. Stapp for the basic philosophical groundwork upon which we have built.

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Michael D. Teeley
Project Director

PREFACE

We have organized this booklet and the teaching materials to make them as easy as possible to use. This booklet contains the basic program philosophy, an overview of all the themes and understandings, our recommendations for overcoming problems of implementation, guidelines for problem-solving, and a booklet on gaming and simulations. Additionally, we have prepared materials on field trips in Lake County, inventories of the Antioch environs, and values clarification guidelines.

You will note that the materials are divided into four grade levels; K-2, 3-5, 6-8, and 9-12. These divisions have enabled us to gear the concepts, understandings, and units to appropriate student ability levels.

We have divided the area of environmental literacy into seven major themes or concept areas; Population, Technology, Energy, Economics, Ecosystem, Environmental Decisions, and Environmental Ethics.

To facilitate their use we have grouped and color coded the materials. Each of the concept areas has a different color cover and all of the materials for that concept area are grouped in the single booklet with a single table of contents. Units may be selected from the table of contents or by using one of the indexes in this booklet.

We have also prepared the concept sheet so that you may find your particular grade level easily. Each level is highlighted in a different color on our master sheet. You should be able to see at a glance all of the understandings for your grade level.

While reviewing the materials please note the order of presentation: behavioral objective; subject areas involved; and the options themselves, three per understanding. The options are distinct and they will provide you with a variety of teaching methods. Explicit directions should make it possible for every teacher to make environmental education part of their teaching.

The pilot program has shown that the modified materials are very easy to use and provide a variety of experiences which integrate environmental education concepts into the existing subject matter. All that we ask of you, the classroom teacher, is that you expend the time and energy needed to select the activities which suit you best.

Environmental education cannot wait and we have attempted to facilitate your involvement.

INTRODUCTION

Since the industrial revolution man has found himself able to govern an increasing number of variables in his daily life. Each new "advance" has brought additional comforts and protection from the vagaries of an often harsh environment. Until the twentieth century, the rather slow rate at which technology brought about changes in lifestyle made it possible for man to comprehend and adjust to the changes. In the twentieth century world population has doubled. There has been a four-fold increase in the people and land in cities, social and technological changes, and environmental pollution have increased at a pace often too difficult to comprehend or even measure.

In 1970 there seemed to be an awakening of a significant portion of the population to the scope and nature of the problems to be faced. Teach-ins, rallies, resolutiosn, and commitments all indicated that people were alarmed and eager to work to resolve the problems of our environment. When the emotion of the period died, there remained relatively few individuals and groups with a long term commitment to dealing with the problems.

Now that the work of these few individuals is resulting in legislative action, new enforcemnt standards, and conflicts between economics and ecology, more people are being forced into action. Individuals must weight the cost of pollution control equipment, as seen in higher priced cars, electricity, and other manufactured goods, against the benefits of cleaner air and water.

To make informed and consistent decisions every citizen must have the opportunity to gain the insights and experience only a strong environmental education program can offer.

To this end, Antioch Community Consolidated School District 34, Antioch, Illinois, working under a Title III FSEA (now Title IVC) grant has developed a kindergarten through high school (K-12) environmental education program.

In the earlier grades the program focuses on heightening student awareness of the world around them and increasing their sensitivity to the interactions taking place there. Their new awareness is used to help them to begin to understand their place in the environment and the importance of each aspect of our world.

As the child progresses through the program in the elementary grades this interest and awareness is utilized to help them begin to understand the intricacies of the many interdependencies and changes taking place in the environment. They also begin to get a feeling for the scale of their world and their place and responsibilities in it.

At the junior high level activities focus on the integration of content with the roblem-solving skills necessary to put their developing environmental ethic into meaningful action.

During high school, activities are designed to refine their problem-solving skills to enable them to handle the problems of trade-offs and the increasing complexity of large scale community problems.

PROGRAM GOALS

The broad overall goals of the program are to create student-citizens who:

* possess a vital interest in their environment,
* are sensitive to even subtle changes in the quality of this environment,
* are able to understand, analyze, and evaluate problems,
* are skilled problem-solvers and
* are motivated to act in the resolution of environmental problems.

Within these broad goals a number of supporting objectives and approaches have been established:

* Increase student sensitivity to the environment through firsthand discovery and inquiry.
* Increase student interest in the environment by integrating environmental education into existing subject matter on a regular basis.
* Increase student knowledge in areas that are necessary for participation in the resolution of environmental problems.
* Increase the ability of students to recognize existing and potential problems in the community.
* Increase student problem-solving ability through carefully monitored personal problem-solving experiences.
* Increase student motivation and desire to become involved in the affairs of the community through successful experiences with community action activities.

PROGRAM STRUCTURE

For any educational program to be effective it must clearly identify those components of learning which will be part of the program. We have identified three principle areas of concern for our program:

COGNITIVE - The factual information related to understanding man's interrelationship with the environment. An environmentally literate citizen should be capable of understanding the broad areas of concern associated with environmental issues and problems. The program structure is designed to relate separate disciplines to each other as they relate to developing an understanding of the scope of environmental issues.

AFFECTIVE - The emotional response of individuals to their environment. For an individual to be consistent in his response to environmental issues he must have a thoroughly thought out system of values. An important aspect of the program is the provision for numerous opportunities for the student to evaluate and modify his values to ensure a value system consistent with individual and societal needs.

PROBLEM-SOLVING - This action component integrates cognitive and affective areas into meaningful activities. To solve environmental problems we must have a citizenry that is not only knowledgeable about the environment but motivated and skilled in dealing with problems. The problem-solving component develops the skills and provides the reinforcment necessary for students to become involved in environmental issues.

To facilitate the development of these components we have structured the program in the following manner:

- Spanning and integrated into the existing grade levels and subject areas.
- Linking subject areas that relate to environmental concerns (interdisciplinary approach).
- Emphasizing the role of the student in the learning process.
- Placing emphasis upon the role of the individual and the need for examination of individual attitudes and values.
- Providing opportunities to develop the critical thinking and problem-solving skills necessary for action.
- Emphasizing social change strategies and the necessity for removing emotion from problem-solving.
- Focusing on the local environment and resources, while not neglecting regional, national, or world issues.
- Emphasizing the future of man and societies.

As the students move vertically through the educational process, K-12, the curriculum will incorporate the above points and aim for a strongly integrated and cumulative program that develops students within our overall program goals who are:

<u>sensitive</u> to and <u>aware</u> of the environment,

<u>interested</u> in and motivated to become involved in usses,

skilled <u>critical thinkers</u> able to recognize the root cause of problems and

skillful <u>problem-solvers</u>.

CONCEPT AREAS AND UNDERSTANDINGS

The environmental education program has identified seven (7) major concept areas and one hundred sixteen (116) understandings aimed at K-12 competence in each of the seven concept areas. These understandings will assist both teachers and students in identifying important understandings related to environmental education. Briefly, the seven concept areas and their foci are:

ECOSYSTEMS -In any program for environmental education it is necessary to develop an understanding of basic ecological principles. All other concepts are dependent upon the student understanding the rules governing the operation of the total system.

We begin with the basic structural aspects of ecosystems, including component identification. From this we progress to explorations of their orderliness, interactions, and complexity. These are then incorporated into investigations of energy needs, a source, its storage, and the different forms of energy needed. The ecosystems are then analyzed to determine how energy is used at various points in food chains.

All of these aspects are then examined to determine the effect man has had on ecosystems and how our role must be altered.

POPULATION - To understand the scale of the problems to be dealt with, students must understand population principles. Any and all solutions to problems must deal with a scale governed by the population affected.

For the youngest student we begin by defining a population and its component parts. We then explore the differences and interactions of a variety of populations. Upon this foundation we

build understandings of the rate of growth and change of populations, the factors affecting changes and the past, present, and future of world populations. Students then explore the variety of alternatives available to us as we attempt to maintain or improve our environment on a worldwide basis.

ENERGY - One of the inescapable problems facing the world today is meeting present and future energy needs. Students must understand the source of energy, its forms, and the transformations necessary for us to use energy.

The program deals with the laws of thermodynamics in both the classical and practical sense. The student is shown the growing need for energy and the problems associated with each of the alternatives. Activities also focus on the time lag associated with bringing energy to the consumer in a form which is usable.

The most important aspect of the energy understandings is the recognition of the need for energy conservation. Conservation will help us to delay the effects of energy shortages while we are developing the clean forms of energy necessary for achieving the United States' goal of energy independence and environmental quality.

TECHNOLOGY - With the rapid advance of technology in recent years there has been a concomitant increase in our dependence upon technologists. Without an understanding of the multiple effects associated with any application of technology we are likely to begin a cycle of events with far-reaching undesirable consequences, as in the case of pesticides.

The technology understandings begin by examining labor and waht we receive for our efforts. Students then examine the changes which have taken place and the influence of these changes upon

our lifestyle. This is then examined for the effects of technology on our use of resources. The student then examines the role of technology in determining our needs and the social costs associated with meeting these needs. The culmination of this topic is the identification of the role of the individual in identifying the trade-offs and concessions to be made in the adoption of an environmentally acceptable lifestyle.

ECONOMICS - For any individual to become involved in environmental issues he must understand the basic principles behind our economic system. It is an inescapable fact that when the issues can be shown as being ecology versus economy, ecology will be the loser.

To sort out fact from fiction the individual must understand trade-offs, political economics, principles of maximizations, and the manner in which industry is able to amortize its costs over time to minimize the effects upon profits and lossess.

In the same respect, the individual must understand the need for a sound economy with sufficient jobs and capital. The student must investigate and be able to explain environmental issues in terms that make sense to all interest groups.

ENVIRONMENTAL ETHICS - For the student to effectively participate in environmental problems he must be convinced that his actions are consistent with the goal of a better environment.

The understandings incorporated into the environmental ethics materials encourage the student to examine his attitudes and values as they relate to this broader goal. The units provide exercises and tests of both individual and societal values.

These materials are designed to reinforce a value system oriented toward stewardship as opposed to use of the environment. Through the normal progression of the program the student examines, applies, re-examines, modifies, and reapplies his values as they relate to his environment. During this development process the student also broadens his perceptual framework to include the divergent value systems of others as they relate to the variety of societies within our ecosystem.

ENVIRONMENTAL DECISIONS - The singular most important segment of our program is the area of environmental decisions. This area brings together, in an action phase, all six of the other concept areas.

This action phase relies on the factual information assimilated in the other areas for the active process of making an effective environmental decision.

The student learns the problem-solving process and puts it to the test in real and simulated decision-making situations. This process integrates the content, the trade-offs, and the values discussed in the other six areas.

Within each of these seven areas the understandings and the teaching units developed for them have been divided into four major grade groupings, K-2, 3-5, 6-8, and 9-12. Each of these groups is designed to make it possible for a given unit to be utilized at more than one grade. This permits the individual teacher to deal with students of different abilities and at the same time limits the possibility of needless repetition of material. Additionally, each unit is designed to be used in more than one subject area and the most applicable areas are noted.

CONCEPT SUMMARY SHEET

	ECONOMICS	ECOSYSTEMS	ENERGY	TECHNOLOGY	POPULATION	ETHICS	DECISIONS
K-2	Money sources Money distribution	The source of energy Ecosystem definition The food chain	The source of energy Needs for energy	Responsibility for work Necessities and luxuries Effects of technology	Animals, people and plant communities Interaction and stress Satisfaction of needs	Needs of people Interactions within societies Values and society Scientific discovery	The nature of choices The responsibility for decisions
3-5	Income sources Economic sources Supply and demand	Ecosystem place Ecosystem energy Ecosystem interactions Pollution and ecosystems	Users of energy Forms of energy Conversion of energy	The effects of technology Influence of technology of lifestyle Rate of technological advancement Lifestyle and natural resources	Predictable population cycles Effect of lifestyle on environment Checks and balances in nature	The effect of lifestyles of the environment Human attitudes and environmental harmony Stewardship of the Earth	The nature of sound decisions The personal nature of decisions Consequences of decisions Time factors and decisions
6-8	Standard of living Economic systems Environmental economics	Ecosystem complexity Forms of energy in ecosystems Energy transfer in ecosystems Capacity for stress in ecosystems	Varying energy needs Energy losses The energy problem Energy forms	The effect of technology on environment The timeline of technological effects The effect of lifestyle on resource demand The effect of demand on the manner of resource use	Origins of population Standards of living Population interactions	Preservation of the natural order Man's role in the world The environment and psychological well-being Meeting future needs	Complexity of decision-making Effects of decisions Decision makers Enforcement of decisions
9-12	Economic systems Environment and economics	Ecosystem dynamics Ecosystem structure Humans and ecosystems	Energy use Energy transformations New problems New solutions	Influence of demand on cost Social costs of technology Technology and trade-offs	Characteristics of populations Population diversity Impact of population growth on resource use and the environment Social implications of populations	Diversity of natural surroundings Implementation of ethics Quality of life and social justice	Scope and aspects of decisions Decision-making and personal values The role of the group in decision-making The effect of laws on environmental decisions

IMPLEMENTATION GUIDELINES

Possible objections to Environmental Education and responses to these objections:

1. Objection

"This program is likely to get us away from the teaching of fundamentals."

Response

The three R-s cannot function in a contaminated environment. Furthermore, in a multi-disciplinary program the teaching of basics can actually be made more meaningful through their application to environmental issues and aspects of the children's world of interest to them.

2. Objection

"I have a required curriculum to cover. I can't work in any more material."

Response

In most cases this program can be used without time loss. These units are designed to teach curriculum concepts that are already required in most system. Here, however, the emphasis is on the environment. It is true that some of the options require more class time than others, but in these cases more than one concept will be covered. Furthermore, the Illinois legislature has decreed that Environmental Education be implemented throughout the state; and this program, it should be noted, has been approved by Title III ESEA.

3. Objection

"Our class periods are too short to accomodate a program of this kind."

Response

Many of the options can be easily covered within a single class period of average length. Where more than one period is required, the transition from one day to the next will present no more of a problem than it would in any other subject area.

4. Objection

"I'm afraid that the preparation time will be prohibitive, and I'm already overworked."

Response

Most of the preparation has already been done. In many instances a careful reading of the directions is the only preparation necessary. It time permits, of course, the teacher may choose an option that requires more extensive background study or the assembling of a greater number of materials. The choice is his.

5. Objection

"This program does not apply to my subject areas."

Response

Environmental Education deals with more than air and water pollution. It is concerned with the relationship between living things and their total environment. In the case of man, for example, the environment can be physical, economic, political, cultural, and the like. In other words, Environmental Education embraces virtually all areas of formal study.

6. Objection

"That's all well and good, but where the community aspects of the program are concerned, I would be at a disadvantage. I'm simply not that familiar with our local resources."

Response

Resource handbooks have been included in our package. Each school system is encouraged to develop its own handbook of local resources, using the Antioch handbook as a guide. Chambers of Commerce, sewage treatment specialists, police departments, recreation directors, and others can be very helpful in the compiling of such a booklet. If a school system is seriously interested in pursuing environmental studies, it should undertake the writing of its own resource manual at the earliest opportunity.

7. Objection

"What if I am absent? Will the substitute teacher have difficulty teaching these units?"

Response

These units should present no more difficulty for the substitute teacher than any other unit would. In fact, the procedures in these options are normally more detailed than those found in most lesson plans.

8. Objection

"It looks to me as though the format of these units provides for very little variety in method."

Response

The order and symmetry of the printed format is misleading. A closer examination will show that the total package calls for the utilization of all standard modes of instruction:

Lecture - demonstration
Questions - discussion
Drill and practice
Audio-visual
Problem solving and discovery
Laboratory - inquiry
Creative response
Role playing - simulations
Independent study - research

9. Objection

"Some of the understandings are unclear."

Response

If the teacher is familiar with the terminology of the understandings, he should have no difficulty in comprehending them. If, after such familiarity is established, an understanding is still confusing, we would appreciate having this brought to our attention for possible revision.

10. Objection

"I doubt whether my students are mature enough to make judgments of the type called for in most of these units."

Response

This is, of course, a genuine concern. However, the only way to foster mature thinking is to place the student in situations that require clear thinking. To this end we have included a values clarification booklet. This set of materials is designed specifically to sharpen student perspective, and this is where mature thinking must start.

11. Objection

"I question any program that tries to teach a system of values. Values are frequently subjective."

Response

These exercises are not designed to impose a value system upon the student but rather to help the student clarify his own values through carefully planned activities.

12. Objection

"Some of these options deal with controversial issues. I'm not sure that I would feel comfortable exploring these areas."

Response

Each teacher must decide for himself whether a given option is too controversial to be handled effectively in his district. The simple expedient of choosing a different option will normally enable the teacher to develop the understanding without colliding with local restraints or customs.

13. Objection

"I cannot encourage my students to become openly involved in community controversy. Because the members of the board of education are fearful of irritating their constituents, they would never permit students to question the city council or the chamber of commerce on such issues as waste disposal, pollution, landfill, or the like."

Response

One of the major objectives of an educational institution is to foster respect for the demoncratic process. As directors of such an institution, board members should be among the strongest backers of constructive democratic action. Our exercises are consistent with the goals of public education. If you follow the problem-solving guidelines you will not offend your board of education.

14. Objection

"We have a tight budget. I doubt whether we can afford to purchase the materials."

Response

The actual cost of the units is very small, and most of the options can be taught without additional cost. The purchase of games, filmstrips, and cassettes can be gradual. The district may expand its total supply of materials as finances permit, or modify the use of those already available.

15. Objection

"Without updating these materials will lose their effectiveness within a very few years."

Response

For the most part these units are conceptual rather than topical. To this extent the core of the program is not "dated". It is understood, of course, that individual teachers will continue to modify these materials over the years in order to keep them "fresh". In fact, totally new units might be added from time to time as the need for them arises.

16. Objection

"It seems to me that it would be extremely difficult to evaluate student progress in a program that is so subjective."

Response

Numerous evaluation tools are included within the individual units. There are discussion questions, theme topics, and pre and post tests. Also included are pre and post tests designed to span years of instruction. Personal values are no more difficult to deal with here than they would be in a typical Humanities class.

17. Objection

"The evaluation of the whole program, however, will be more complex. I am not sure I will know where to start."

Response

Carefully constructed evaluation forms have been included within the package. They should be quite adequate for the purpose.

18. Objection

"General resistance and apathy could seriously hamper our ability to implement this program."

Response

To fight resistance and apathy on the part of the community, the administration, the teachers, or the students, a number of steps can be taken:

Community

1) Send an information letter during the first week of school to inform parents of their son/daughter's involvement in the Environmental Education program.

2) Hold evening parental information sessions early in the school year to inform and involve the parents.

3) Encourage teams of parents, students, and teachers to become involved in community-based encounters.

4) Send newsletters to parents informing them of future field trips and progress being made in the program at their school.

5) Whenever possible work through community organizations on publicity and resources.

Administration

1) Clarify the position of the administration toward environmental education to determine how firmly they are committed to the environmental education program.

2) Hold information sessions for all administrators to update them on the environmental education program and to establish a feedback and evaluation network at the administration level.

3) Investigate the possibility of more flexible scheduling where necessary, i.e. year-round school, team teaching, modules, etc.

4) Develop a more reasonable field trip policy for schools involved in the environmental education program.

Teachers

1) Enumerate and clarify the long-range goals and sub-goals of the environmental education program.

2) Provide a staff co-ordinator to assist teachers in the implementing of the total environmental education program.

3) Co-ordinate requirements of other programs with the needs of the environmental education program to avoid duplication of field or encounter experiences.

4) Provide teachers with financial remuneration for attendance at workshops.

5) Keep the community well informed on the objectives of the program in order to allay teacher concern over the discussion of attitudes and values.

Students

1) Let students make choices. Help them to establish a positive vested interest in their school and community.

2) Provide students with problem-solving opportunities, by letting them choose the areas they wish to investigate and by encouraging encounters in the field.

3) Help the students use their experience to build upon classroom concepts.

4) Help the students develop greater perspective in the implementing of change strategy.

GUIDELINES FOR PROBLEM SOLVING

Realizing the importance of problem-solving to our environmental education program, we must first delineate some guidelines to be observed in order to be truly effective in the community. These guidelines are not intended to restrict problem-solving but to aid in the tactful and educationally productive involvement of students in school and community affairs.

The structure for effective problem-solving can be seen as a six step process with a seventh, evaluative step added for educational purposes.

DEFINE THE PROBLEM OR ISSUE

This step, while not the most difficult, may be the most important phase of the entire effort. We must clearly define the precise issue and not the symptom of the problem. We should not permit ourselves to get lost in an emotional approach to a symptom and in the process overlook the root cause. The role of the teacher at this point is to maintain the educational analytical attitude toward the entire process. Problem-solving is not a diversion, but a learning experience that is part of the regular school program.

The local government wants to place a sanitary landfill in a marsh west of town but in the village limits.

BECOME INFORMED

This can be both the most laborious and most interesting phase of the process. During this phase students must learn about all sides of the issue and, using critical thinking processes, attempt to separate fact from fiction. This may mean using a variety of information sources from technical reports to firsthand interviews of citizens. A note of caution at this point. If the most effective means of data gathering means bringing in experts or going out in the community, be certain that you have cleared this with the administration beforehand. In public institutions we must be aware of the dangers involved in dealing with controversial issues. Be certain that your purpose is clearly defined and the program carefully monitored. An important aspect of problem-solving is sensitizing the problem-solvers to the attitudes and mores of the

community. Also, if the students will be conducting surveys in the community, be certain to publicize the event well in advance and clearly identify each student so that they are expected and are not seen as intruders. It goes without saying that the structure of the questions and the appearance of the students should also be carefully considered.

AGAINST

1. People near the site don't want it because it is noisy and they think unsightly.

2. The local conservation group complains that the marsh is a good hunting and fishing place and they don't want to lose it.

3. Local residents downstream are afraid the loss of natural drainage will cause flooding.

4. Research shows the exact dangers of landfill are not completely identified.

5. County health officials say there is danger to local wells if the site is not made properly.

6. The county soil conservation district says the site is unsuitable for a landfill.

7. Research shows the landfill takes five to ten years to cause damage to water supplies, if at all.

8. Government offices oppose the site if any better site is available. Site availability is left up to the village officials.

9. The local area is part of a large state and federal program to clean up local bodies of water.

FOR

1. The company running the site is one of the largest and best in the country.

2. The company will give half of the site to the city for a park when finished.

3. The village trustees feel the site is the best one for their needs.

4. There is no conclusive data proving pollution.

5. The village needs a site close to town for dumping wastes.

6. The closest site is more than eight miles from town.

7. Surveys of residents show most care very little about the issue.

IDENTIFY POSSIBLE SOLUTIONS

Once the students have a well-defined, well researched problem, they should be able to identify some potential solutions that will have a degree of merit. Some of these may be more functional than others but they should in some manner remove or eliminate the problem. At this point you should use value clarification strategies to begin to rank order these alternatives prior to final selection and development of a plan of action.

1. Close the site and force the users to find a new site.

2. Clean up the site and give them permission to operate under close control.

3. Expand and manage the site and deal with flooding and pollution when and if they occur.

4. Give the operators six months to develop enough facilities to eliminate problems.

5. Close the site and negotiate a new contract for an alternate site at higher cost.

6. Educate the community on ways to reduce garbage and close the site and use an alternate site.

SELECT AMONG ALTERNATIVES

At this point the students are going to select what they feel is the most efficient and tactful solution to the problem at hand. Be certain that you have decided on a plan of action that "fits" the community. Long lasting and effective change occurs only when the solution is accepted by the group(s) affected. The solution must also fit the capabilities of the students involved in implementing the plan. At this point you may find you have two or three plausible alternatives that may be equally effective. If this occurs you may want to select more than one and develop a comparative study to maximize your chances of success.

Among the six alternatives identified, there were only four with any long range merit. These were ranked according to what the students felt would have the most benefits for the community.

1. Educate the community on ways to reduce garbage and close the site and use an alternate site.

2. Give the operators six months to develop enough facilities to eliminate problems.

3. Clean up the site and give them permission to operate under close control.

4. Close the site and negotiate a new contract for an alternate site at higher cost.

The choices each have good and bad aspects that must be dealt with. The best alternative based upon community attitudes seemed to be #1. This was also the alternative the students felt best equipped to handle.

DEVELOP AN ACTION PLAN

To really bring the process to fruition you should make a point of developing a plan to implement the selected alternative. This is the format for the public action phase of the process and should be carefully laid out to consider the resources and abilities of the students as well as the community affected by the plan. Also be certain to involve as many community groups as possible.

The main aspect of the plan selected requires that the community be shown ways to reduce their garbage output so that the higher cost of the new disposal site will not be felt by the taxpayer.

The educational program will focus on local newspapers and the schools. The points of the plan are:

1. Encourage consumers to use returnable bottles.

2. Start a program to recycle glass.

3. Organize a program for regular paper drives.

4. Provide homeowners with information necessary to start home compost heaps.

5. Encourage and organize homeowners to recycle tin and aluminum cans.

6. Provide incentives for reducing the amount of waste picked up at the home.

IMPLEMENT THE PLAN

The implementation of the plan is usually the easiest step in this process, providing the first five steps have been well done. It is also the most rewarding for those involved. This phase produces publicity and elicits public reaction to the students, the school, and the teacher. If you have carefully monitored and assisted the students and everyone has done their job you will find that the overall reaction will be positive.

> Everyone is involved in the implementation of the plan. Students prepare new releases for the local papers. They prepare a number of posters for reminders of recycling and the program goals. The village board prepares a resolution to encourage recycling. Local businesses make more returnables available. The local newspapers publish reminders to the public.

EVALUATE THE PROCESS

This step is optional due to the possibility that an on-going evaluation may have been taking place during the first six steps. However, because this is an educational task with an educational objective it may be especially productive to review the process which took place and to point out the strong and weak points in the approach. Carefully done this can help to encourage further activities and produce a more educationally rewarding product.

> The students must evaluate their program. This usually takes the form of written and/or verbal means. It is best to keep this time open and let the students air their differences.

Throughout the problem-solving process we should be aware of the real purpose behind having students become involved in community affairs. We are not trying to correct all the wrongs of the community or to pinpoint blame. Our major goal is to help students to become effective, highly motivated and highly skilled problem-solvers. This may take many field experiences or one, but each experience should be carefully structured within our educational goals.

GAMING AND SIMULATIONS

INTRODUCTION

One of the most difficult problems for educators is the type of approach to be taken in introducing subject matter. Stimulating student interest, holding that interest, and leading the students to ask beneficial questions are aspects which the teacher should always keep in mind. A solution to this dilemma is achieved through the use of games in the classroom.

The connotations of the word "game" create within the students an immediate interest and enthusiasm not elicited by many of the other types of learning activities. The teacher benefits from the start. He further benefits by seeing the participation of students who normally may not get involved. A by-product is the marked reduction in student behavior problems.

The picture is not completely one-sided. Disadvantages do exist but in most cases they are outweighed by the advantages. Depending upon the type of game all students may not be able to play at one time. Noise level in the classroom may become high even though this noise is due to participation not the lack of it. Other advantages and disadvantages depend upon the type of game being played.

At this point we should explain what games are. Many different definitions of games are available. We shall consider a game any activity involving one or more players that has a fixed set of constraints placed upon the players with a specific goal or goals in mind and some sort of end point. The number of constraints may vary from a loosely structured game to a highly structured game. In the latter a pre-determined outcome is predictable

with little or no thought required of the players for that outcome. The learning in this type of game takes place in the ensuing discussion. The specific educational purpose may be anything from a general objective for the game to a specific end point to the game. In the former type an end point exists although it is not easily determined and this end point can vary each time the game is played. Clearly, there is a great amount of variety in the types of games on the market.

We feel that the benefits of games may have been overlooked as a source of learning. They may afford just the approach educators have been looking for. Direct student involvement makes student feel more comfortable in handling new topic areas and removes inherent fears of facing unexplored materials. We believe that one of the best ways to learn about a topic is to "live" through the experience; games provide these experiences in a safe, practical, enjoyable and usually economical manner. It is the purpose of this booklet to bring teachers up-to-date on educational games; the different types available; the advantages and disadvantages of each type; and short descriptions of actual games on the market.

TYPES OF GAMES

The simulation game can be used to do three major things - (1) present information; (2) elicit responses or provide a situation for practice; (3) assess performance and evaluate feedback. Within the scope of these parameters lie a number of advantages and disadvantages which the classroom teacher should be aware of.

Advantages of simulation games are numerous and they combine the great appeal of relevance with immediate feedback for the student. In the laboratory setting he may encounter real life conflicts in microcosm and learn to deal with them intellectually. The game makes certain social phenomena more observable to the student. Alternative courses of action are tried and discarded by him. Implications of these actions may immediately be discussed. Choices are weighed and tested. Rational decisions are fostered above emotional reactions. As such, the game is especially well suited to the decision-making process in the classroom. Real-life situations may be compressed within the time and space of a class period. Perhaps the leading characteristic of the simulation game is its ability to bring about high student motivation. Classroom teachers tend to value this advantage most highly, as so many positive student behaviors follow from it.

There are a number of disadvantages to be considered. Students may focus on the game element itself rather than upon the concept it is meant to reflect. Following from this idea is the criticism that simulation games oversimplify real life situations. Simulation games are frequently time consuming and may require teacher training. However, properly trained teachers with a willingness to devote adequate time to play and discussion will eliminate most of the disadvantages listed above.

The other large category of classroom games being marketed is non-simulation games. This term covers a broad range and generally refers to games in two specific ways: Many are not open-ended or they are open-ended in a uniquely different way. There is a

specific plan to them and a pre-determined manner in which the game should be ended. Non-simulation games are played in accordance with the rules of a given subject area. For example, a math game would be played by the rules of mathematics. The subject area most often imposes its own structure in non-simulation games. The rules, then, do not simulate the rules of the subject area - they are its rules.

The advantages of this type of game are like those typical of the first category - highly motivating, relevant, and capable of leading the student through the decision-making process. Students who have failed at regular classroom activities, often find success in playing non-simulation games.

There are several disadvantages to this type of game as well. The teacher must have a thorough knowledge of the rules involved and must be an effective guide to the students. The familiarization process may take time. The playing time of the game may also be long. If this specific amount of time cannot be allotted, the success of the game may be jeopardized. These disadvantages may be overcome by careful planning. A more difficult problem to cope with is that of the student who tends to over-emphasize winning above all other objectives in the game. Without the care and sensitivity of the teacher in this matter, the educational value of the game may be overlooked.

Simulation and non-simulation games may be presented in a variety of ways. Some are played on a board; some are not. The format and equipment of a game, the number of players who may play, and the roles of these players will depend upon objectives and rules of that game. At this point we should briefly mention role-

playing in more detail. There are three basic types of role-playing commonly used by simulation and non-simulation games. The first is free-form role play. No specific roles are assigned. The players are free to pretend to be whomever they wish. The second is limited role play. Specific roles are assigned to the player, but personality characteristics are not specified. Players might have such roles as laborer, sea captain, father. The third is assigned role positions. In this category the role specifications detail what kind of person inhabits the given role, for example: Laborer - with a grudge against management. In most games in which role-playing is used all players know what the assigned roles are and which players possess them. In some games, however, a person may be assigned a role which only he knows about. This is a source of mystery to the others in the game and, as such, may invoke distrust and outright hostility from his team members.*

If role playing is used in a game, it is used to serve the objectives of that game.

Besides becoming familiar with the many available educational games and their uses, teachers will benefit from learning to design their own games. Through a formula of specific steps most classroom objectives may be built into a game which will apply directly to a given classroom and the specific needs of a given group of children. Game design may be developed by adherence to these steps:

(1) Statement of the overall objectives to be taught;

(2) Determination of such elements as duration of the game and issues to be covered;

*This type of role play would be uniquely that of a catalyst.

(3) Identification of the individual groups or organizations who will be making the critical decisions;

(4) Determination of players' objectives - power, wealth, influence - in the context of the game;

(5) Determination of the players' resources - physical, social, economic, political, informational;

(6) Determination of the desired flow of resources and information to and from each player;

(7) Statement of what criteria or decision rules will decide how information and resources will flow among players;

(8) Identification of outside forces on the roles of players (Example: No violence permitted in competition among Quakers.);

(9) Formulation of scoring rules;

(10) Choice of form for presentation and manipulation of players' actions (board game, role play, paper/pencil exercise, computer simulation) and the sequence of operations to be used.

We suggest that both teachers and students become involved in the creation of new games or in the modification of old ones.

In order to further acquaint teachers with game models, let us give a detailed description of one representative game from each major category. Teachers may follow through the game procedures and analyze for themselves the outcome.

Planet Management is an example from the first category, simulation games. This simulation makes use of a "programmed data bank" that determines the composite results of the manipulations of the management factors on a closed planet. Players are able to "manage" the budget of the planet and allocate resources in a manner which they feel will effectively develop the planet. Within the structure of the game time is compressed and data from

succeeding rounds is displayed graphically so that the students can evaluate the success of their various decisions. Simulations of this form are very close to computer simulations. However, they avoid the mystery and expense of the computer while at the same time providing the variables of the computer program. These games are extremely successful due to their ability to be used by entire classes and to the minimal amount of time required to set them up and play them.

Community Planning Map is an example from the second category, non-simulation games. This open-ended game revolves around an 8'x8' vinyl floor map of the Toledo area. The major features of the area, rivers and expressways, are painted on the scale map and students, generally elementary, construct their own city around these features. This enables the students to show what they would put into a city and to explain why they think the separate components belong where they put them. This has the advantage of not forcing the students to follow any set pattern and also causes them to ask questions about the nature of their community. Once a community has been built, perhaps over a period of many days, the students are able to compare it to their community. Games of this type are very well suited for elementary grades because there are no rules and students can use their imagination and develop their powers of observation while at the same time learning about their community.

Redwood Controversy, a role-playing game, is an example from a third category, containing properties of both simulation and non-simulation games. Redwood Controversy involves students in the resolution of a land-use problem in a small community. To complete

the game the students must assume roles and, within the constraints of the roles, attempt to persuade others to adopt their position. Within the structure of the game the teacher can expect students to gain firsthand experiences in the areas of government, language arts, environment, biology, and communications. The open structure of these problem-solving games enables the teacher to bring in subject matter over long periods when students are at an impasse or to run the game in a single class period. These problem-solving games can be considered good starters for students about to become involved in problem-solving activities in their community. They can also be utilized to introduce a new subject area or the need for a new area of content.

These in-depth analyses of three games may serve to explain the basic game categories and to complete our discussion of the potential uses of games in the classroom. A more extensive game inventory follows. In conclusion, we recommend the use of gaming and simulation in the classroom as an alternative to traditional classroom methods and as one of the best ways of involving students in the Environmental Education Program in low-risk problem solving.

Balance — INTERACT

Grade: 5-College

Time: Three weeks for one hour each day

Players: An entire class

Format: Balance simulates the value conflicts facing the American family in dealing with the environmental crisis in our cities, by means of role-playing.

Concepts and Skills: The ecosystem concept, socio-cultural attitudes, critical evaluation of the extent of the environmental crisis and information retrieval and utilization. The game format also builds communication skills through individual presentation.

Business Strategy — AVALON HILL

Grade: 6-12, Adult

Time: 2-3 class periods (12 game months)

Players: 2-4 players

Format: The Banker gives each player, including himself, $10,000 in cash, four pawns of the same color and one sheet from the Running Record pad. Climate situation cards are shuffled and placed face down on the playing board. The game consists of 12 turns, each representing one month. The winner is the player with the most cash on hand at the end of the December turn.

Concepts and Skills: This game exposes the business world for what is really is. It parlays native shrewdness, common sense and proper management principles into the most relaistic game of its kind. It shows how to control the economy, how to protect yourself during labor strife, how to combat consumer boycott, how to avoid texes (legally) and how tc be successful in business.

Clean Water — DAMON

Grade: 7-12

Time: 1-2 hours

Players: 2-4

Format: This is a board game designed to teach basic ecology through role-playing and problem solving.

Concepts and Skills: The basic ecological principles of an aquatic system and city planning related to the system are emphasized. Players learn the relationshps of various parameters upon an aquatic system.

Clug — UNIVERSITY OF MICHIGAN ENV. SIMULATION LABORATORY

Grade: 6-12

Time: 3 hours initially and one half hour for subsequent play sessions

Players: 15-30

Format: This is a board game with greatest emphasis upon role-playing and interaction.

Concepts and Skills: The game can be used to teach community land use, history, sociology, human relations, almost any area focusing on the city.

Communities in Nature (Ecology Learning Module) SVE

Grade: K-2

Time: Variable - This module may be employed as a full unit or portions of it may be used as supplementary to other science material.

Players: This module may be used by individuals or in small or large group instruction.

Format: The kit combines two games, eight sound filmstrips, four murals with vinyl adherents, one food chain chart, one food web chart, vinyl chart adherents, student discovery booklets and data sheets. The kit is a total learning experience with clearly worded teacher manuals to use as guides.

Concepts and Skills: The primary concept taught is that a community is made up of living things that affect each other. Related topics are distribution of energy through food chains and webs, community balance and the roles of plants and animals in communites.

Compacts INTERACT

Grade: 9-12

Time: 5-6 hours

Players: 30-40

Format: This is a simulation game which includes a Black Board and location of a Wall Newspaper. It might also include a portable P.A. System used to simulate radio or television news broadcasts. It also requires a Leader's table with issue cards, resources box, chance and unanticipated consequences cards, extra ART and proposal forms, additional instructional materials, badges, Community Directory, etc. Finally, it also includes a Mayor table with badges, role description sheets and sample forms. One might also use a table for coffee or other refreshments.

Concepts and Skills: Compacts has been used as a rehabilitation planning game nationally to train Federal and state administrators and planners. Compacts has been widely used as a "priming" game in many settings. Compacts has been successfully redesigned by participants to deal with neighborhood action; juvenile programs and the administration of criminal justice; community mental health and community development.

Cope INTERACT

Grade: 6-12

Time: 20 periods of fifty minutes each

Players: An entire class

Format: Cope simulates five future time periods in an imaginary think-tank city. After examining the problem of coping with change, students experience the stresses and anxieties caused by rapid change. Working to accomplish many tasks and to solve several problems, they face a future world's technology that is changing so fast that they have trouble keeping up with it. By the end of the simulation, students realize that the future is coming faster than they think and that human beings will have to learn to adapt and create in order to survive in this fast-changing world.

Concepts and Skills: The game teaches the student to relate in writing an experience-formed description of these concepts; future, change, adapt and cope. It also describes what future civilization will gain and lose by pursuing each of three alternative routes in two of the following categories; communications, language, transportation, production, entertainment, general life quality and innovative technology. The following skills are taught: writing a self-evaluation and group-evaluation of skills at coping with change; using a highly abbreviated simulation language called Future Speech; describing three strategies for coping with change and the stresses each causes.

Council INTERACT

Grade: 6-12

Time: Fifteen class hours

Players: The entire class

Format: After students take a pre-test on their knowledge of local government, Council begins as students become citizens of the city of Riverstream. Their first task as citizens is to elect a city government. They file petitions for office, make campaign posters, give speeches and elect a mayor and five city council persons. These individuals form the nucleus of the city government. The mayor appoints a city recorder and the chairperson of the Riverstream Planning Commission. Other students receive identities as additional planning commissioners, city and state officials and concerned citizens.

The government and citizens now begin solving local problems. Council contains outlines for 20 problems facing the government.

A typical day has many activities taking place. The city council holds meetings with angry citizens; a planning commission attempts to zone new land; newspaper reporters cover all events; other citizens do research on future topics of the council.

Council concludes when students retake the pre-test and then hold a debriefing period in which they evaluate city government, local problems, proposed solutions and the simulation itself.

Concepts and Skills: The game teaches the concept of basic election procedure; responsibilities of local officials, functions of local government; typical local government problems; and the zoning process. The following skills are taught: organizing and delivering a speech to persuade; making decisions as an individual and within a small group and reading maps.

The Dead River EDUCATIONAL GAMES HAWKINS & PLOUTZ

Grade: 7-12, College and Adult

Time: Five playing sessions or one sitting of about 4 hours

Players: 10-32

Format: This is a role-play, simulation game.

Concepts and Skills: The game uses and develops decision-making skills, knowledge of the social and human ecological problems of water pollution, a feel for cost-benefit considerations and a chance to simulate government-citizen interactions.

Dig INTERACT

Grade: 5-junior college

Time: Five weeks

Players: The entire class

Format: In Dig, competing teams create secret cultures; artifacts are made that reflect these cultures. Each team buries its artifacts for the other team to excavate and reconstruct. A final confrontation reveals the accuracy of each team's reconstruction and analysis. This is a simulation game.

Concepts and Skills: This game teaches that all people, past and present, have shaped their beliefs and behavior in the face of universal human needs and problems; that the various elements of any culture are interrelated and cannot be understood without examining the culture as a whole; that the culture of any society is constantly being altered; that it is difficult to examine and interpret cultures different from your own; that art reflects the ideas and moods of a culture; and that individual effort and group success are closely interrelated.

Dirty Water DAMON

Grade: 7-12

Time: 1-2 hours

Players: 2-4

Format: This is a board game designed to teach basic ecology through role playing and problem solving.

Concepts and Skills: Players become acquainted with the complexities of controlling water pollution in local bodies of water, without indiscriminately restricting industrial activities. Cost of pollution abatement measures and dealing with overpopulation of certain aquatic species are dealt with.

Ecology: The Game of Man and Nature DAMON

Grade: 7-12, College and Adult

Time: 2-6 hours

Players: 2-4

Format: This game is primarily a board game. Learning takes place from debriefing for the most part rather than in the game itself.

Concepts and Skills: Students try to achieve a balance between man's activities and the natural environment, while advancing through the Four Ages of Development: hunting, agricultural, industrial and environmental.

Ecopolis INTERACT

Grade: 4-6

Time: Fifteen days

Players: The entire class

Format: Ecopolis begins with a simulation within a simulation. Students are "born" as insects, animals, Indians and pioneers living in an ecosystem existing in America over 150 years ago. While the instructor introduces certain ecological concepts, insects and animals move, die or adapt to the changing environment being reshaped by growing numbers of westward-advancing and technology-carrying American pioneers. Those who survive in the ecosystem receive bonus points at the beginning of the actual simulation. But prior to moving into Ecopolis (a large American city and suburbs built upon the ecosystem which they have just experienced) students complete a survey of what they know about Ecology and the American environment.

Concepts and Skills: The game teaches the concept of the ecosystem, how man's attitude toward his physical environment shapes and changes that environment, the degree of pollution in America, its causes and possible solutions, the problem of overpopulation, how serious it is, what does it mean and what should or should not be done about it. The following skills are taught: outlining material; notetaking; using material provided to support general statement; role-playing; and defending a point of view in front of a group.

The Energy-Environment Game — EDISON INSTITUTE

Grade: 9-12, Adult

Time: 5-7 days (Teachers have reported great success in 7-10 days)

Players: 32 or an entire class

Format: This is a simulation/role-play game which includes detailed assigned roles and considerable resource materials (film-strip, record, spiritmasters, wall map, site selection information and related reading matter). It attempts to teach that there are no easy, simplistic, readily available solutions to the problems that face us.

Concepts and Skills: The concepts of this this game involve analyzing objectively the ecological, technical, economic and political considerations and trade-offs in planning power plants and other energy-related problems of regional planning.

Environmental Realities — INTERACT

Grade: 1-12

Time: 1-3 hours depending on amount of discussion between plays

Players: 4-6 players or teams of players

Format: This is a board game, played with real pictures, cards, a spinner and markers. All players are called upon to participate fully in discussion. A player proceeds to move around the board according to the yes-votes or vetoes of opponents.

Concepts and Skills: This game attempts to develop within students an awareness and appreciation of the realities of a modern city. It also exposes students to possible remedies for urban problems. Students are given opportunity to express values and to organize and evaluate ideas as they apply to the city.

Evolution: The Geologic Time Chart — EDUCATIONAL GAMES HAWKINS & PLOUTZ

Grade: 5-12, Adult

Time: 40 minutes - 1 hour

Players: 2-6

Format: This game is played with a board, chips, markers and dice. The object of the game is for students to win by evolving into higher animal forms (preferably monkey or man) and by increasing his population.

Concepts and Skills: This game deals with animal life on earth. Players assume the role of animals and compete for existence, dominance and evolution into higher forms. Students learn the names of eras and periods in proper order along with animals that lived at each point in time. Evolution follows the most widely accepted time theories and is accurate to time and animals introduced within each period and era.

Executive Decision 3-M BOOKSHELF GAME

Grade: 6-12, Adult

Time: 2-4 class periods (12 rounds)

Players: 2-6

Format: This is a board game in which students as top-level executives of a large corporation make monthly decisions regarding the purchase of raw materials and the manufacturing and selling of finished goods. Since prices fluctuate according to supply and demand, each decision the player makes affects the overall profits or losses of his corporation. Player who succeeds in making the most profit for his corporation is the winner.

Concepts and Skills: Students learn about the rule of supply and demand; decision making regarding the purchase of raw materials; the manufacturing and selling of finished goods.

Litterbug DAMON

Grade: K-5

Time: Less than 1 hour

Players: 2-4

Format: This is a board game in which a student wins by the volume of trash he has collected from the board and therefore because he has done the best job of cleaning streets and sidewalks.

Concepts and Skills: Students proceed around the board collecting litter which they deposit in their trash containers. The object of the game is to keep the community clean and free of litter by depositing trash in proper receptacles.

The Lobbying Game — INTERACT

Grade: 7-12

Time: 3 hours

Players: 34

Format: This role-playing simulation is played in a large room with as many chairs as players, arranged to simulate a legislative chamber. Students are assigned roles, given materials and instructed to promote the submission of bills. Discussion and lobbying follow.

Concepts and Skills: The Lobbying Game teaches intricacies of the legislative process.

Making Your Own World — COCA-COLA COMPANY

Grade: 4-8

Time: Variable, three hours or as long as the teacher wishes

Players: An entire class

Format: This is a very flexible game designed to produce role-playing. With proper leadership all players participate.

Concepts and Skills: The game involves city-planning, critical thinking, problem solving, ecology, social interaction and role playing. This is a very visual game that involves everyone and can be extremely valuable for instruction.

New Town — HARWELL ASSOCIATES

Grade: 6-14

Time: Variable for different grades

Players: 2-4 per board

Concepts and Skills: Decision-making, problem solving, planning and environmental improvement

Format: This board game builds a number of situations which teach about community construction, government, planning, or cooperation for better government.

N-Trow-P ENVIRONMENTAL EDUCATION OFFICE

Grades: 6-9

Time: 20-40 minutes

Players: 3-6

Format: Board game with bean bag toss board

Concepts and Skills: The game teaches about entropy through a play strategy designed around energy flow through a community.

Planning the Human Community (Ecology Learning Module) SVE

Grade: 5-8

Time: Variable - This module may be employed as a complete unit or portions of it may be used in any order as supplementary to social sciences or life sciences.

Players: For small or large group participation

Format: The kit combines the Planning Game, the simulation game, eight sound filmstrips, and related resource material. The kit is a total learning experience. The filmstrips provide conceptual readiness for the simulation. The board game provides skills readiness.

Concepts and Skills: The primary concept taught is that any human community both affects and is affected by the natural environment around it. It also teaches students that trade-offs are required in order to preserve a high quality of life and to preserve the environment.

The Pollution Game DAMON

Grade: 7-12, Adult

Time: One to two periods

Players: 4-8

Format: This is a board game requiring students to make decisions which may or may not help to clean up the environment. They are forced to deal with rising air and water pollution which results as a byproduct of their moves throughout the game.

Concepts and Skills: The student will develop problem-solving, critical thinking, and appreciation for dealing with pollution problems.

Population: A Game of Man and Society DAMON

Grade: 6-12, College and Adult

Time: 2-3 hours

Players: 2-6

Format: This is a board game dealing with population.

Concepts and Skills: This game points out the balance, usually lacking, between population growth and resources that is so necessary for a country to avoid problems. The idea of a population explosion is graphically portrayed.

The Propaganda Game WIFF & PROOF

Grade: 9-12 (Teacher may wish to "water down" for use with eighth grade students)

Time: 1 hour or more (considerable additional time to be allotted for absorbing directions)

Players: 2-4

Format: This game is primarily played with idea cards and a clear thinking chart. Cards are drawn and students identify flaws and techniques of logic.

Concepts and Skills: In this game, students are led to become aware of the emotional overtones in all arguments and suggestions. They attempt to identify propaganda techniques while gaining control over their responses to the ideas they encounter daily.

Queries 'n' Theories — WIFF & PROOF

Grade: 9-12, Adult

Time: 1 hour or more (considerable additional time will be required for interpretation of directions)

Players: 2-4

Format: This game sequence is played with individual game charts, colored plastic chips and an egg timer. The rules are designed so that the play is a simulation of the scientific method.

Concepts and Skills: Students are introduced to some basic ideas of modern linguistics and the scientific method of inquiry. Theories are built and tested. Queries 'n' Theories is a series of games which move from the simple to the complex which can be played as a pure game or for "what it all means" in relationship to science and linguistics. It has the advantage of adaptation to students of unequal abilities.

Smog — DAMON

Grade: K-5

Time: 1 hour or less

Players: 2-6

Format: Hopscotch-type game where students hop around "town" replacing trash cards with beauty cards.

Concepts and Skills: The game deals principally with trying to get students to have positive attitudes toward substituting trash problems with beauty solutions of different varieties.

Smog DAMON

Grade: 7-12

Time: 1-2½ hours

Players: 2-4

Format: This is a board game dealing with air pollution and city management.

Concepts and Skills: The students develop the skills involved in city management, decision making, problem solving, environmental management and critical thinking.

Stocks and Bonds 3-M BOOKSHELF GAME

Grade: 7-12, Adult

Time: 2-3 class periods (ten game years)

Players: 2-8

Format: This game transports students to Wall Street. They shrewdly invest in the game's ten securities, buying and selling each year (each round) in an attempt to become the wealthiest stockholder in the game. The game has a unique calculator which tells students if they have had a Happy Monday or a Black Friday.

Stocks and Bonds is for two to eight players. The bookshelf case contains a stock board, marker, dice, calculator, record sheets, situation cards, stock certificates and instructions.

Concepts and Skills: Students become familiar with the many jobs of Wall Street. They become familiar with securities, buying and selling, and how to become rich or poor from the Stock Market. Students also learn the many terms used when dealing with Wall Street.

Stock Market Game AVALON HILL

Grade: 6-12, Adult

Time: 2-3 class periods

Players: 2-4 (It may be expanded to include an entire class.)

Format: The Broker gives each player, including himself, $2000 in cash, ten shares of Blue Chip stock, ten shares of Speculative stock and five Trading Post discs of the same color. All remaining cash and certificates are kept in the "bank". The Broker goes through a series of moves and trend cards are shuffled and placed face down on the playing board. The winner is the player who has the greatest net worth at the end of Turn 12.

Concepts and Skills: The skills and concepts are somewhat similar to the ones learned in Stocks and Bonds. Basically, students become familiar with market terms; ways of making or losing money; the jobs of the Broker, etc.; and other skills when dealing in the stockmarket.

GAME MANUFACTURERS

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APPENDIX

Economics 7: At the completion of this unit the student will be able to explain through discussion and/or writing how the amount of goods a society produces is directly related to a society's knowledge of technology.

Option 1 - The students through simulation will work out an economic problem with various degrees of technological knowledge.
Option 2 - Students research various world countries to illustrate the various levels of economic growth throughout the world.
Option 3 - Students chart the growth of various countries throughout the world.

Economics 8: At the completion of this unit the student will be able to list the components of an economic system.

Option 1 - Students construct an imaginary car utilizing all the components of an economic system.
Option 2 - Students study the home/family in an economic system.

Option 3 - Students view a natural system (the body) identifying the producers and consumers and inputs and outputs.

Economics 9: At the completion of this unit the student will be able to identify his own economic goals and how they affect his immediate environment.

Option 1 - Students list items necessary for existence as compared to a "comfortable life".
Option 2 - Students identify objects they use in their everyday life and the resources needed to produce and use them.
Option 3 - By filmstrip, the students analyze the environmental problems in other countries and relate them to economic goals.

Energy 7: At the completion of this unit the student will be able to explain why different cultures use different amounts of energy.

Option 1 - Students view filmstrips and discuss the effects of different cultures on energy consumption.
Option 2 - Students study people from different countries to investigate resource use.
Option 3 - Through the use of a filmstrip and other resources, the student investigates methods of transportation and energy use.

Energy 8: At the completion of this unit the student will be able to explain how energy is rapidly lost during the conversion to a form usable by man.

Option 1 - A comparison of potential and kinetic energy is made through the use of an inclined plane.
Option 2 - Students play a board and beanbag game, "N'Trow-P", which shows how the sun's energy is lost on its way to man.
Option 3 - Students use a paddle wheel to measure energy.

Energy 9: At the completion of this unit the student will be able to explain why the energy problem is a worldwide problem.

Option 1 - Through the use of filmstrip and charts, students investigate worldwide resource reserves and consumption.
Option 2 - Students use an index to determine the energy use quality of their local environment.
Option 3 - A game through which students learn about the balance between money, resources, and power by trading.

Energy 10: At the completion of this unit the student will be able to explain why existing forms of energy may not be used in the future.

Option 1 - Students draw a timeline of energy use throughout history.
Option 2 - Students plot points to identify changing energy use over time.
Option 3 - Students role play a debate to decide on the best forms of energy.

Population 10: At the completion of this unit the student will be able to explain the different theories about the origin of living things.

Option 1 - Students investigate the different theories about the origin of life.
Option 2 - Students study about fossils and make their own.
Option 3 - Students stage a mock Johnny Carson Show on the origin of life.

Population 11: At the completion of this unit the student will be able to list at least one way in which the United States population consumes a disproportionate amount of the earth's resources.

Option 1 - Students make bar graphs from world consumption information given in chart form.
Option 2 - Students chart their daily activities on a clock and investigate the energy usage during this time.
Option 3 - Students write letters to foreign countries to determine energy usage.

Population 12: At the completion of this unit the student will be able to explain why different standards of living produce different environmental consequences.

Option 1 - Students do a survey of goods purchased in a local supermarket.

Option 2 - Students make a comparison between past and present lifestyles and their effect on population.
Option 3 - Students do a utility consumption survey.

Population 13: At the completion of this unit the student will be able to explain why interactions between populations may be complimentary, competitive, or mutually beneficial.

Option 1 - Students investigate a vacant lot for a study of litter and population of plants and animals.
Option 2 - Students collect trash and map problem trash areas.
Option 3 - Students construct a terrarium for observation.

Technology 9: At the completion of this unit the student will be able to give an example of how an application of technology has economic, social, and/or ecological impact.

Option 1 - Students simulate an assembly line to develop a product in order that they may clearly see the impact of mass production on the individual.
Option 2 - Students construct collages to illustrate the impact of technology on their lives.
Option 3 - Students attempt to solve an air pollution problem through their knowledge of technology.

Technology 10: At the completion of this unit the student will be able to give examples of the effects of technology that are either immediate or delayed and either detrimental or beneficial.

Option 1 - Students, through role play, discuss the ramifications of a "company town" and its dependence upon continued production.
Option 2 - Students simulate an assembly line as discussion leads them to an awareness of the human impact of technology.
Option 3 - Students view a filmstrip on the TVA to stimulate a discussion of the positive and negative effects of technology.

Technology 11: At the completion of this unit the student will be able to explain and illustrate how the patterns and practices in the use of natural resources are influenced by lifestyle and level of industrialization.

Option 1 - Students take surveys of past lifestyles to contrast that of modern society to illustrate the impact of today's world.
Option 2 - Students focus on a particular aspect of their lifestyle and how it affects the environment.
Option 3 - Students graph the effects of a complex situation on the performance of a small animal.

Technology 12: At the completion of this unit the student will be able to demonstrate or explain how the consumption of resources increases with the demand for goods.

Option 1 - Student groups describe lifestyles based upon given data.
Option 2 - Students survey their own home to find out how much energy their families use.
Option 3 - Students collect data on their school's cafeteria to determine the amount of energy used to produce the meals.

Ethics 9: At the completion of this unit the student will be able to list ways in which wise use of the environment is guided by a desire to preserve the natural order.

Option 1 - Students prepare a visual representation of topic areas through the use of different media.
Option 2 - Students make a compost.
Option 3 - Students investigate the effects of different substances on the environment.

Ethics 10: At the completion of this unit the student will be able to demonstrate that the earth's resources exist for all living things not just man.

Option 1 - A study of the abuse of the environment in advertising is conducted.
Option 2 - Students play a game that points out the abuses of advertising.
Option 3 - Through viewing a film the students discuss dependencies in nature and chart these dependencies.

Ethics 11: At the completion of this unit the student will be able to explain how certain lifestyles enable man to live as a complimentary part of the environment.

Option 1 - Students investigate ways in which man does not live in harmony with nature.
Option 2 - Students use natural dyes to dye clothing.
Option 3 - Students become more aware of their environment by heightening their senses.

Ethics 12: At the completion of this unit the student will be able to list three ways in which the environment contributes to the physical and psychological well-being of living things.

Option 1 - Students construct a collage and design a parking lot.
Option 2 - Students measure lung capacity of smokers versus non-smokers.
Option 3 - Several stresses are placed in the classroom environment forcing the students to decide which to remove.

Ethics 13: At the completion of this unit the student will be able to give an example of how, by protecting the earth, it will be better able to meet the needs of all living things now and in the future.

Option 1 - Students debate on gas allotments through the use of "roles".
Option 2 - Students are made part of an extremely crowded situation to test their reactions.
Option 3 - Students investigate local plant and animal life by taking a nature walk.

Decisions 8: At the completion of this unit the student will be able to show examples of why we must look beyond obvious symptoms and attack root causes in order to solve a problem effectively.

Option 1 - Students study the problem of automobile air pollution and the attempts to solve it.

Option 2 - Students discuss current issues of controversy and are asked to participate in a values clarification exercise to illustrate the complexities of decision-making.
Option 3 - Students are given a hypothetical situation that threatens various aspects of their environment. They are asked to form decisions based on the values they hold.

Decisions 9: At the completion of this unit the student will be able to use history in making an effective environmental decision.

Option 1 - Students use available data to determine cause and possible effects of water pollution. Further, the students use this data to propose solutions to the problem.
Option 2 - Students use rainfall data from the past years to speculate on future agricultural problems. In so doing, they construct solutions to future problems based upon historical data.
Option 3 - Using historical data on energy, population, autos, and solid waste, students predict future trends and solutions to problems.

Decisions 10: At the completion of this unit the student will have made decisions that consider benefits for all socio-economic classes.

Option 1 - Simulating a state hearing, students view various sides of a controversy to observe the political decision-making process.
Option 2 - Students view the pros and cons of the SST to analyze its ultimate value to society.
Option 3 - Students use opinion polls to categorize various socio-economic groups and their attitudes.

Decisions 11: At the completion of this unit the student will be able to identify the environmental abuses, who causes them, and who can initiate corrective action.

Option 1 - Offering various methods through the different disciplines, students analyze the problem of water pollution caused by recreational use. Through their data collection, they propose solutions to the problem.
Option 2 - Students survey different environmental abuse areas in their community and find who is responsible for their management.
Option 3 - Students rank order members of society in terms of their responsibility for correction of environmental abuses.

Decisions 12: At the completion of this unit the student will illustrate his awareness that some people and organizations have more power than others to influence decisions.

Option 1 - Students will use school related issues to observe the power structure of the school.
Option 2 - Students through simulation will be viewing societies' power structures and the impact of money.
Option 3 - Writing letters to various government lobbies aid the students' observation of political decision-making process.

Decisions 13: At the completion of this unit the student will be able to define and illustrate an enforceable decision.

Option 1 - Students will create rules to solve classroom problems. These rules will be continually changed until they are enforceable.
Option 2 - Using a hypothetical problem, students role play various positions to overcome the problems. Solutions are under constant attack until they are enforceable.
Option 3 - Students identify local problems and determine whether local officials are constructing enforceable rules.

Ecosystems 10: At the completion of this unit the student will be able to explain how the degree of complexity of an ecosystem is measured by the number of its component parts and the number of interactions between the parts.

Option 1 - Students study two ecosystems closely - an anthill and a classroom - and make comparisons.
Option 2 - Students study the terms population and community through the use of a filmstrip.
Option 3 - Students study community interactions and chart interactions within their own community.

Ecosystems 11: At the completion of this unit the student will be able to recognize some of the basic laws which govern the actions of the components of our ecosystem.

Option 1 - The necessity of laws in general and laws within the ecosystem in particular is scrutinized by the students.
Option 2 - The film, The Lorax, is viewed and students discuss the implications of the film.
Option 3 - Students prepare short three-act plays to depict the elements necessary to sustain life.

Ecosystems 12: At the completion of this unit the student will be able to explain how some of the sun's energy has been stored as coal, peat, petroleum, natural gas, and other fossil fuels.

Option 1 - Students diagram different cycles and study the sun's rule in each.
Option 2 - Students design and draw/build a Rube-Goldberg machine.
Option 3 - Students trace the manufacturing of various products back to the sun.

Ecosystems 13: At the completion of this unit the student will be able to explain how energy is lost, mainly as heat, with each transfer of energy within an ecosystem.

Option 1 - Students study the heat given off in respiration of yeast cells.
Option 2 - Students study the energy budget as measured by caloric intake and physical exertion.
Option 3 - Students investigate the changes made to increase the efficiency of the modern "farm factory".

Ecosystems 14: At the completion of this unit the student will be able to explain why the amount of energy necessary to maintain an ecosystem is directly related to the amount of stress placed on the system.

Option 1 - A series of classroom stresses is placed upon students to see what reactions they have.
Option 2 - Students play a game, "Toothpick Birds", which points out how the need for food places a stress on a system.
Option 3 - "Predator-Prey Tag" is a game which points out survival of the fittest.

Ecosystems 15: At the completion of this unit the student will be able to explain how a pollutant affects a natural cycle.

Option 1 - Students view a film showing man's harmful effect on nature through pollution.
Option 2 - Students measure BOD and DO content of water samples.
Option 3 - A film and discussion point out how chemicals can be pollutants in the human system.